

REMARKS/ARGUMENTS

Status of Claims:

Claims 1-65 were pending in the present application before this amendment as set forth above. Of these, claims 2, 3, 5, 7, 11, 12, 15-27, 29, 30, 32, 38-47, 49, 50, 52 and 57-65 were withdrawn as being drawn to non-elected subject matter. By this amendment, claims 1, 28 and 48 are amended, claims 2, 3, 5, 7, 11, 12, 15-27, 29, 30, 32, 38-47, 49, 50, 52 and 57-65 are canceled, and new claims 66-73 are added. Applicant reserves every right in the canceled claims to file divisional/continuation applications. No new matter is added.

The October 20, 2008 Office Action:

In the October 20, 2008 Office Action, the Examiner rejected claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. In addition, claims 1, 4, 6, 8-10, 13 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wax (CH2847 IEEE, 1990, 2157-2160, hereinafter "Wax") in view of U. S. Patent No. 6,406,840 to Li et al. (hereinafter "Li") and further in view of U.S. Pat. Pub. No. 2002/0159642 to Whitney (hereinafter "Whitney"). Also, claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that is regarded as the invention. Further to the rejections, the Examiner objected to the specification under 35 U.S.C. § 132(a) as introducing new matter into the disclosure. Additionally, the Examiner indicated that the originally filed declaration was defective.

Applicant very much appreciates the Examiner's careful review of the instant application.

In response, as set forth above, claims 1, 28 and 48 have been amended to particularly point out and distinctly recite aspects of the present invention, and the specification has been amended to correct the informalities, as suggested by the Examiner, so that the amended claims, written description, abstract and drawings are consistent with each other. Also, previously withdrawn claims 15-27, 38-47, and 57-65 are canceled without prejudice. Moreover, new claims 66-73 have been introduced to conform the claims to the embodiments of the present invention disclosed in the specification, as originally filed.

Support for the amendments can be found in the specification and drawings, as originally filed. Applicant asserts that no new matter is added.

Any amendments to the claims not specifically referred to herein as being included for the purpose of distinguishing the claims from cited references are included for the purpose of clarification, consistence and/or grammatical correction only.

Additionally, Applicant respectfully submits herewith a fully executed declaration that has corrected oversights in the originally filed declaration.

It is now believed that the application is in condition for allowance at least for the reasons set forth below and such allowance is respectfully requested.

The following remarks herein are considered to be responsive thereto.

Oath / Declaration

In the October 20, 2008 Office Action, the Examiner asserted that the oath or declaration was defective and that a new oath or declaration was required in compliance with 37 CFR 1.67(a). Specifically, the Examiner asserted that the oath or declaration was defective because “non-initialed and/or non-dated alterations [had] been made to the oath or declaration, filed 19 June 2008. On the bottom of page 4, “Nashville”, “Tennessee”, an address and a zip code have been crossed out and “San Jose”, “California” with a second zip code has been written in without being dated and initialed.” In response, as set forth above, Applicant respectfully submits herewith a fully executed declaration in compliance with 37 CFR 1.67(a) that has corrected these oversights in the originally filed declaration.

Objections to the Specification

In the October 20, 2008 Office Action, the Examiner objected to the specification under 35 U.S.C. § 132(a) as introducing new matter into the disclosure, asserting that the paragraph on page 72, lines 9-21 submitted with Applicant’s June 19, 2008 amendment, added a negative limitation to the disclosure and is considered to be new matter. Specifically, the Examiner asserted that ‘[i]n one embodiment, a confidence level is used to control the iterative process of refinement of the agent classification...when reaching a threshold value, then the iterative process is stopped.’ The disclosure previously did not provide matter to define what controls the iterative process and subsequently what stops the iteration of steps. Confidence levels and threshold[s] are disclosed, (page 73, second and third paragraphs; page 74, lines 13-14), however they are not provided in terms of controlling or stopping the iterative process.”

Applicant respectfully traverses this objection, since the specification, as originally filed, provides adequate support for control of the iterative process and what stops the iteration of steps, for example, in paragraphs on page 69, lines 36-38 through page 74, lines 1-31 of the specification, and in Figs. 8 and 22-24 of the drawings, as originally filed. Particularly, as disclosed in paragraphs on page 72, lines 22-38 through page 74, lines 1-2, “different signal classification algorithms can be utilized to classify an agent. In one embodiment as shown in Fig. 23, for the process 2351 shown at the upper half, sets of available measurements 2301...are chosen and used as input data to the feature extraction process 2302 that graphically define algorithms to extract properties from the raw cellular measurements. From these data, feature sets 2303 are computed,... [where] *[s]pace 2305 is an example of a poorly classified decision* [see corresponding confidence factor of 20% in Fig. 23], *where feature distributions overlap to each other*, based upon a particular feature extraction process 2302. A similar process 2353 as shown in the lower half of Fig. 23, however, *produces a feature space 2306 that represents a good classification* [see corresponding confidence factor of 90% with clear separation] *of three regions from a different extraction process* ...[An] important phase of signal classification is the initial *feature extraction*. Design of the feature extraction algorithms is *an iterative process* as partially shown in Fig. 23 ... A Principal-Component-Analysis (PCA)/Cluster separation reveals that the classes are *only separable with a 20% confidence level*. In the lower half of Fig. 23, a *refinement* of the feature *extraction* shown as process 2353 changes the biological model to 2nd order and adds a new model as a feature (O-). *Successive PCA shows that the classes are now separable with a 90% confidence level* ... In this scenario, the number of features at each decision node would be relatively limited and *assignment to one class or the other would be made on the goodness of fit between data and model*. On the other end of the spectrum it can be used to design classification systems even if very little is known about physiological principles. In this scenario, the number of features would be large, the system provided with labeled examples, and it would simply *compute decision boundaries in the feature space,” i.e. the system can stop the iterative process according to the relation between decision boundaries.*” Furthermore, as disclosed on page 69, lines 1-3, the design environment 800 “has *multiple customized interfaces 801* communicating with users including microbiologists, hardware/sensor engineers, and diagnostic experts...[and] a *microcontroller 810.*” (Emphasis added.)

Moreover, as disclosed in page 74, lines 18-31 of the disclosure as originally filed and shown in Fig. 24 of the drawings as originally filed, in the diagnosis process 2400, "specific feature extraction and classification methods at 2403 (or more) can be repeated until desired results are obtained, *for example, when a desired robustness factor is obtained.*" (Emphasis added.)

Therefore, no new matter has been added and Applicant respectfully requests that the objections to the specification be withdrawn.

Claim Rejections under 35 U.S.C. § 101

In the October 20, 2008 Office Action, the Examiner rejected claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 under 35 U.S.C. 101 because the Examiner asserted that the "claimed invention is directed to non-statutory subject matter."

In response, as set forth above, without acquiescing in the Examiner's rejections and to facilitate the prosecution of the current application, Applicant has amended each of claims 1, 18, and 48 to recite, in part, "wherein the method steps are performed by a controller."

Support for the amendments can be found in disclosure, as originally filed, for example, in paragraphs from page 69, lines 21-38 to page 70, lines 1-26 of the specification and in Fig. 8 of the drawings, which disclose that preferred embodiments of the present invention can involve "apparatuses or devices that have biological, electronic, and microfluidic components *interfacing each other and interacting together.*...As schematically shown in Fig. 8, a design environment 800 according to the present invention has multiple *customized interfaces 801 communicating with users including microbiologists, hardware/sensor engineers, and diagnostic experts.* The environment 800 has a *microcontroller 810* that, among other things, contains models 802-805 operated therein, *receives inputs from the interfaces 801* and drives system generators 806, 808. System models include biological models 802 that capture cellular metabolic cycles including cellular products, *physical models 803 that capture sensor configurations, digital processors, fluid processing hardware, and other devices on the chip,* cell diagnosis models 804 that capture the differential diagnosis procedure including measurement parameters, decision logic based on measured/computed parameters, *and physical actions* to change cellular environmental parameters, control strategy models 805 that define how to achieve the cellular environmental parameter changes *using the hardware defined in the*

physical models 802.” (Emphasis added.) In other words, the methods performed by the system are *tied to a particular machine or apparatus* and, in one or more embodiments, *transform a particular article into a different state or thing.* *Bilski*, 545 F.3d at 954. Moreover, system generator 808 *“converts the models 801-805 into executable code 811 that contains the software and hardware configuration information, and runs on the physical device 809 to perform cell diagnostics in the application-specific bio-microcontroller 814,” i.e. useful, concrete, and tangible results are produced.”* (Emphasis added.)

Accordingly, Applicant respectfully submits that the 101 rejections to claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 have been overcome, and thus requests that the 101 rejections to claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 be withdrawn. Applicant respectfully submits that these claims are patentable for at least these reasons. Moreover, newly added claims 66-73, which depend from allowable amended claims 1, 28, and 48, are patentable at least for this reason.

Claim Rejections under 35 U.S.C. § 112

In the October 20, 2008 Office Action, claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that is regarded as the invention. Specifically, with regard to claim 1, the Examiner asserted that the metes and bounds are unclear for the limitation “iteratively repeating steps d)-g) until the agent is discriminated” in line 1 of step h, and that “one skilled in the art would be unclear as to when repeating steps d)-g suffice in discrimination of [the] agent.” Additionally, with regard to claim 28, the Examiner asserted that the metes and bounds are unclear for the limitation “iteratively repeating steps e)-h) until a plurality of classes for the reagent is separated with a desired corresponding confidence level” in lines 1-2 of step i, and that “one skilled in the art would be unclear as to when repeating steps e)-h) would suffice with a desired corresponding confidence level.” Further, with regard to claim 48, the Examiner asserted that the metes and bounds are unclear for the limitation “iteratively repeating steps f)-i) until a class for the agent with a desired robustness factor is obtained” in lines 1-2 of step j), and that “one skilled in the art would be unclear as to when repeating steps f)-i) would suffice with a desired robustness factor being obtained.” Applicant respectfully traverses these rejections for at least the reasons set forth below.

Claim 1, as amended, recites “iteratively repeating steps (d)-(g) *until the agent is discriminated with a desired corresponding confidence level.*” (Emphasis added.) Support for this amendment, and clear descriptions of the metes and bounds of the claim and what suffices as a desired confidence level can be found in the disclosure, particularly in paragraphs on page 71, lines 20-36 to page 74, lines 1-2 of the specification and in Figs. 22 and 23 of the originally filed drawings.

Claim 28, as amended, recites iteratively repeating steps (e)-(h) “*until a plurality of classes for the agent is separated with a desired corresponding confidence level.*” (Emphasis added.) Clear definitions including the metes and bounds for this limitation, as well as descriptions of what suffices as a desired confidence level, can be found in the disclosure as originally filed, particularly in paragraphs on page 72, lines 28-38 to page 74, lines 1-2 of the specification and in Fig. 23 of the drawings.

With regard to claim 48, as amended, the metes and bounds of the limitation “iteratively repeating steps f)-i) *until a class for the agent with a desired robustness factor is obtained*” are clearly defined in the disclosure as originally filed, for example, on page 74, lines 18-31 of the specification and shown in Fig. 24 of the drawings. (Emphasis added.) Additionally, support for “robust” and “robustness factor” can be found in the disclosure of provisional patent application 60/310,652, the entire contents of which is incorporated by reference in the present application. For example, support can be found on page 84, lines 14-28 and in Fig. 25. Support can also be found on page 81, lines 10-11, page 83, lines 13-15, p.84 lines 14-15 and 24, and on page 87, line 35 of the provisional patent application.

For at least these reasons, Applicant respectfully submits that claims 1, 28 and 48, as amended, particularly point out and distinctly claim the subject matter of the current invention. Therefore, Applicant believes that the claim rejections under 35 U.S.C. § 112 to claims 1, 4, 6, 8-10, 13, 14, 28, 31, 33-37, 48, 51 and 53-56 are now overcome and respectfully requests that these rejections be withdrawn. Applicant respectfully submits that these claims are patentable for at least these reasons. Moreover, newly added claims 66-73, which depend from allowable amended claims 1, 28, and 48, are patentable at least for this reason.

Claim Rejections under 35 U.S.C. § 103

In the March 19, 2008 Office Action, claims 1, 4, 6, 8-10, 13 and 14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Wax in view of Li et al. and further in view of Whitney. Applicant respectfully traverses the rejection made by the Examiner at least for the reasons set forth below.

Claims 1, 4, 6, 8-10, 13 and 14:

Claim 1, as amended, recites a method for discriminating an agent that includes the steps of:

- “(a) constructing a decision tree having a plurality of branches, ***each branch corresponding to at least one defined action***, wherein each branch comprises a plurality of successive branches, each successive branch corresponding to the at least one defined action;
- (b) providing a conditioned environment sensitive to the agent;
- (c) obtaining data from response of the agent to the conditioned environment;
- (d) extracting features from the obtained data;
- (e) selecting a branch from the decision tree corresponding to the features;
- (f) ***performing on the features the at least one defined action corresponding to the branch***;
- (g) producing a classification of the agent;
- (h) ***iteratively repeating steps of (d)-(g) until the agent is discriminated***; and
- (i) storing the classification of the agent...” (Emphasis added.)

The method for discriminating a unknown agent requires ***actively planning and performing experiments, collecting specific measurements on the experiments***, and selecting algorithms for classification of the unknown agent ***from a set of data collected from the experiments***, i.e. the data set emerges as a result of the classification process acquiring the necessary measurements. In one embodiment, the method in one embodiment has the following steps: in step (a) a decision tree having a plurality of branches with each branch corresponding to at least one defined action is constructed. The step involves in planning for the ***creation of new data***, selecting a series of experiments that maximize the potential for agent discrimination. In

step (b), a conditioned environment sensitive to the agent is provided for performing the experiments. In step (c), *a set of data is obtained from the response of the agent to the conditioned environment in the experiments*, as detected by one or more sensors. Entirely different modalities of measurements can be acquired, based on sensor selection. Then, features are extracted from the set of data in step (d). In step (e), a branch is selected from the decision tree corresponding to the features. In step (f), the at least one *defined action* corresponding to the branch is performed on the feature. This describes *dynamic action on the sample and apparatus*. In step (g), a classification of the agent is produced. Then, steps of (d)-(g) are iteratively repeated until the agent is discriminated. *The computation/experiment is an integrated process, where the data emerges from the process*. The final result of the classification of the agent is stored for use. (See Example 6 of the specification, and Figs. 8 and 22-24 of the drawings.)

In contrast, as understood by Applicant, Wax describes an approach at construction of a tree-structured classifier from *a known, existing set of training data*. The classifier applies multiple levels of discriminators, branching at each point as a result of tests run on *the existing data set*. In the October 20, 2008 Office Action, the Examiner concedes that Wax “does not show steps b)-d, f) and h)” of independent claim 1.

Li discloses “cell arrays comprising a plurality of tubes containing populations of cells that are immobilized therein. The arrays are particularly useful for conducting comparative cell-based analyses.” (Li, Abstract.) In the October 20, 2008 Office Action, the Examiner concedes that “Wax and Li et al. do not show steps d), f) and h)” of independent claim 1.

Whitney describes a closed-loop process of a trial-and-error approach “for designing algorithms that allow for fast retrieval, classification, analysis or other processing of data, *with minimal expert knowledge of the data being analyzed*, and further, *with minimal expert knowledge of the math and science involved in building classifications and performing other statistical data analysis*” (Whitney, Abstract, emphasis added). But, *the data to be processed is a fixed, existing data set, which cannot cure the deficiencies of Wax and Li*.

Indeed, the method of amended claim 1 has many patentable and novel steps, as set forth in the following Table 1, which are not disclosed, taught or suggested in Wax, Li and Whitney, taken alone or in combination.

Table 1: Comparison of Recitations of Claim 1 of the Present Application with Wax, Li and Whitney (“√” or “×” indicates Wax/Li/Whitney has or does not have the limitation(s) required by amendment claim 1, respectively)

Recitations of Amended Claim 1 of the Present Application	Wax	Li	Whitney
A method for discriminating an agent, comprising the steps of:	√	×	√
(a) constructing a decision tree having a plurality of branches, <i>each branch corresponding to at least one defined action</i> ;	×	×	×
(b) providing a conditioned environment sensitive to the agent;	×	√	×
(c) obtaining data from response of the agent to the conditioned environment;	×	√	×
(d) extracting features from the obtained data;	×	×	√
(e) selecting a branch from the decision tree corresponding to the features;	√	×	√
(f) <i>performing on the features the at least one defined action corresponding to the branch</i> ;	×	×	×
(g) producing a classification of the agent;	√	×	√
(h) <i>iteratively repeating steps of (d)-(g) until the agent is discriminated with a desired corresponding confidence level</i> ; and	×	×	×
(i) storing the classification of the agent for use, wherein the method steps are performed by a controller.	×	×	√

In summary, *none of Wax, Li and Whitney, taken alone or in combination, disclose, teach or suggest* the method for discriminating an agent that, among other things, has the following patentable and inventive steps;

- (1) constructing a decision tree having a plurality of branches, *each branch corresponding to at least one defined action*,
- (2) *performing on the features the at least one defined action corresponding to the branch*;
- (3) *iteratively repeating steps of (d)-(g) until the agent is discriminated*,

as recited in amended claim 1 of the present invention.

Accordingly, Applicant respectfully submits that a *prima facie* case cannot be made to support the rejections to amended claim 1 under 35 U.S.C. 103(a) over Wax in view of Li and further in view of Whitney. First, there is no suggestion or motivation to modify the references or combine the reference teachings. Second, there is no reasonable expectation of success of combining the reference teachings. Finally, the combination of references does not teach or suggest *all elements* of Applicant's claims set forth above in Table 1.

In supporting the obviousness rejections under 35 U.S.C. 103, the Examiner "bears *the initial burden...of presenting a prima facie case of unpatentability*...After evidence or argument is submitted by the Applicant in response, patentability is determined *on the totality of the record*." *Ex parte Wada and Murphy*, BPAI Appeal No. 2007-3733 (January 14, 2008), and "*Office personnel must articulate*", among other things, "*a finding that the prior art included each element claimed ...*", MPEP 2143 (A)(1). The "*unwitting application of hindsight*" is *inappropriate*. *Ex parte So and Thomas*, BPAI Appeal No. 2007-3967 (January 4, 2008). In other words, the Examiner's "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). (MPEP 2142). (Emphasis added.)

Therefore, for at least the foregoing reasons, independent claim 1 is patentable under 35 U.S.C. 103(a) over Wax, Li and Whitney.

Accordingly, previously presented claims 4, 6, 8-10, 13 and 14, as well as newly added claims 67-69, which depend from allowable amended claim 1, are patentable at least for this reason.

New claims 66-73:

Among other unique limitations, newly added independent claim 66 recites "a method for discriminating an agent, comprising the steps of:

- (a) providing a controller programmed to perform the steps of:
 - (i) constructing a decision tree having a plurality of branches, *each branch corresponding to at least one defined action, wherein each branch comprises a plurality of successive branches, each successive branch corresponding to the at least one defined action;*

- (ii) providing a conditioned environment sensitive to the agent;
 - (iii) obtaining data from response of the agent to the conditioned environment;
 - (iv) extracting features from the obtained data;
 - (v) selecting a branch from the decision tree corresponding to the features;
 - (vi) *performing on the features the at least one defined action corresponding to the branch;*
 - (vii) producing a classification of the agent;
 - (viii) *iteratively repeating steps of (d)-(g) until the agent is discriminated with a desired corresponding confidence level;* and
 - (ix) storing the classification of the agent for use; and
- (c) providing a memory device in communication with the controller for storing the classification of the agent.” (Emphasis added.)

Applicant respectfully submits that new independent claim 66 incorporates the same or similar patentable distinguishing features of amended claim 1, and therefore, for at least the reasons set forth above with respect to why amended independent claim 1 is patentable under 35 U.S.C. 103(a) over Wax, Li and Whitney, new claim 66 is patentable under 35 U.S.C. 103(a) over Wax, Li, and Whitney.

As set forth above, new claims 67-69 depend from allowable independent claim 1, as amended and are patentable at least for this reason. Moreover, claims 70 and 71 depend from allowable independent claim 28, as amended and are patentable at least for this reason. Also, claims 72 and 73 depend from allowable independent claim 48, as amended, and are patentable at least for this reason.

New claims 67-73 also contain additional patentable subject matter. For example, claim 68 recites “wherein the desired corresponding confidence level is at least 90 percent” and claim 73 recites “wherein the desired robustness factor is at least 80 percent.” None of Wax, Li, or Whitney disclose, teach, or suggest a method including this step, taken alone or in combination. Accordingly, individual consideration of each claim is respectfully requested.

CONCLUSION

Applicant respectfully submits that the foregoing Response places this application in condition for allowance. If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, to facilitate the prosecution, please call the undersigned at 404.495.3678. No fee is due, but the Commissioner is hereby authorized to charge any petition fee under 37 CFR 1.17(f),(g) or (h) or any deficiency of fees and credit of any overpayments to Deposit Account No. 50-3537.

Respectfully submitted,

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